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March 2, 1843.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

1. A paper was read, entitled, "On the Laws of Individual Tides at Southampton and at Ipswich." By G. B. Airy, Esq., M.A., F.R.S., Astronomer Royal.

The author gives the results of his own personal observations of the tides at Southampton and at Ipswich, in both of which places they present some remarkable peculiarities. In conducting these inquiries he obtained, through the favour of Colonel Colby, R.E., and Lieut. Yelland, R.E., the able assistance of non-commissioned officers and privates of the corps of Royal Sappers and Miners. He explains in detail the nature of his observations, and the method he pursued in constructing tables of mean results; and deduces from them the conclusion, that the peculiarities in the tides which are the object of his investigation are not dependent on any variations in the state of the atmosphere, but are probably connected with the laws which regulate the course of waves proceeding along canals.

2. A paper was in part read, entitled, "On the Special Function of the Skin." By Robert Willis, M.D. Communicated by John Bostock, M.D., F.R.S.

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March 9, 1843.

Sir JOHN WILLIAM LUBBOCK, Bart., V.P. and Treasurer,  
in the Chair.

John Miers, Esq., was balloted for, and duly elected a Fellow of the Society.

1. The reading of a paper, entitled, "On the Special Function of the Skin." By Robert Willis, M.D. Communicated by John Bostock, M.D., F.R.S., was resumed and concluded.

The purpose which is answered in the animal economy by the cutaneous exhalation has not hitherto been correctly assigned by physiologists: the author believes it to be simply the elimination from the system of a certain quantity of pure water, and he considers that the saline and other ingredients which pass off at the same time by the skin are in too inconsiderable a quantity to deserve being taken into account. He combats by the following arguments the prevailing opinion, that this function is specially designed to reduce or to regulate the animal temperature. It has been clearly shown by the experiments of Delaroche and Berger, that the power which animals may possess of resisting the effects of a surrounding medium of high temperature is far inferior to that which has been commonly ascribed to them; for in chambers heated to 120° or 130° Fahr., the tempe-

perature of animals is soon raised to  $11^{\circ}$  or even  $16^{\circ}$  above what it had been previously, and death speedily ensues. The rapid diminution or even total suppression of the cutaneous exhalation, on the other hand, is by no means followed by a rise in the temperature of the body. In general dropsies, which are attended with a remarkable diminution of this secretion, an icy coldness usually pervades both the body and the limbs. A great fall in the animal temperature was found by Fourcauld, Becquerel and Breschet to be the effect of covering the body with a varnish impervious to perspiration; and so serious was the general disturbance of the functions in these circumstances, that death usually ensued in the course of three or four hours.

The question will next arise, how does it happen that health and even life can be so immediately dependent as we find them to be on the elimination of so small a quantity of water as thirty-three ounces from the general surface of the body in the course of twenty-four hours? To this the author answers, that such elimination is important as securing the conditions which are necessary for the endosmotic transference between arteries and veins of the fluids which minister to nutrition and vital endowment. It is admitted by physiologists that the blood, while still contained within its conducting channels, is inert with reference to the body, no particle of which it can either nourish or vivify until that portion of it which has been denominated the *plasma* has transuded from the vessels and arrived in immediate contact with the particle that is to be nourished and vivified: but no physiologist has yet pointed out the efficient cause of these tendencies of the plasma, first, to transude through the wall of its efferent vessels, and secondly, to find its way back again into the afferent conduits. The explanation given by the author is that, in consequence of the out-going current of blood circulating over the entire superficies of the body perpetually losing a quantity of water by the action of the sudoriparous glands, the blood in the returning channels has thereby become more dense and inspissated, and is brought into the condition for absorbing, by endosmosis, the fluid perpetually exuding from the arteries, which are constantly kept on the stretch by the injecting force of the heart.

In an appendix to the paper, the author points out a few of the practical applications of which the above-mentioned theory is susceptible. Interference with the function of the skin, and principally through the agency of cold, he observes, is the admitted cause of the greater number of acute diseases to which mankind, in the temperate regions of the globe, are subject. He who is said to have suffered a chill, has, in fact, suffered a derangement or suppression of the secreting action of his skin, a process which is altogether indispensable to the continuance of life; and a disturbance of the general health follows as a necessary consequence. Animals exposed to the continued action of a hot dry atmosphere die from exhaustion; but when subjected to the effects of a moist atmosphere of a temperature not higher than their own, they perish much more speedily; being

destroyed by the same cause as those which die from covering the body with an impervious glaze ; for, in both cases, the conditions required for the access of oxidized, and the removal of deoxidized plasma, are wanting, and life necessarily ceases. The atmosphere of unhealthy tropical climates differs but little from a vapour-bath at a temperature of between  $80^{\circ}$  and  $90^{\circ}$  Fahr.; and the dew-point in those countries, as for example on the western coast of Africa, never ranges lower than three or four degrees, nay, is sometimes only a single degree, below the temperature of the air. Placed in an atmosphere so nearly saturated with water, and of such a temperature, man is on the verge of conditions that are incompatible with his existence : conditions which may easily be induced by exposure to fatigue in a humid atmosphere under a burning sun, or other causes which excite the skin while they prevent the exercise of its natural function. The terms *Miasma* and *Malaria* may, according to the author, be regarded as almost synonymous with air at the temperature of from  $75^{\circ}$  to  $85^{\circ}$  Fahr., and nearly saturated with moisture.

2. A paper was also read, entitled, "On the Cause of the reduction of Metals from solutions of their salts by the Voltaic circuit." By Alfred Smee, Esq., F.R.S., Surgeon to the Bank of England.

The reduction of a metal from its saline solution by the agency of voltaic electricity, has, the author states, been explained in three different ways. By Hisinger, by Berzelius, and by Faraday it has been ascribed to the liberation of hydrogen in this process : Davy and others considered it as resulting directly from the attraction of the metal to the negative pole : and Daniell conceives that the metal is directly electrolysed by the action of the voltaic circuit. The author found that the ends of copper wires, placed in a solution of sulphate of copper between two platina poles in the circuit, manifest electric polarity ; so that while one end is dissolving, the other is receiving deposits of copper : he also found that platina was, in like manner, susceptible of polarity, although in a much less degree than copper, when placed in similar circumstances. With a view to determine the influence of nascent hydrogen in the voltaic reduction of metals, he impregnated pieces of coke and of porous charcoal with hydrogen, by placing them, while in contact with a metal, in an acid solution, when they thus constituted the negative pole of the circuit ; and he found that the pieces thus charged readily reduced the metals of solutions into which they were immersed ; and thence infers that the hydrogen is the agent in these reductions. From another set of experiments he concludes, that during these decompositions, water is really formed at the negative pole ; a circumstance which he conceives is the chief source of the difficulties experienced in electro-metallurgic operations when they are conducted on a large scale, but which may be avoided by a particular mode of arranging the elements of the circuit so as to ensure the uniform diffusion of the salt.

The author obtained the immediate reduction of gold, platina, palladium, copper, silver and tin from their solutions by the agency